

# PROJECT FACT SHEET

**CONTRACT TITLE:** Development of a 3-Component Borehole Seismic Source-Chevron (PARTNERSHIP)

**DATE REVIEWED:** 08/04/1994

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**OBJECTIVE:** Develop a clamped, vibratory borehole seismic source that will provide both P- and S-waves with high output energy over a broad frequency range.

<b>ID NUMBER:</b> FEW 2836.600	<b>CONTRACTOR:</b> Sandia National Lab
<b>B &amp; R CODE:</b> AC0530000	<b>ADDR:</b> Department 6114 P.O. Box 5800 Albuquerque, NM 87185
<b>CONTRACT PERFORMANCE PERIOD:</b> 09/30/1991 to 01/30/1996 <b>PROGRAM:</b> Supporting Research <b>RESEARCH AREA:</b> Geoscience	<b>CONTRACT PROJECT MANAGER:</b>  <b>NAME:</b> Marion W. Scott <b>ADDR:</b> Sandia National Lab P.O. Box 5800, Dept. 6114 Albuquerque, NM 87185 <b>PHONE:</b> (505) 845-8186 <b>FAX:</b> (505) 844-0240
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## SCHEDULED MILESTONES:

Establish CRADA	12/92
Design vertical actuator, electronics, and downhole hydraulic power supply	10/93
Fabricate vertical actuator, electronics, and downhole hydraulic power supply	05/94
Test single axis tool	06/94
Design radial and rotary actuators	06/94
Fabricate radial and rotary actuators	05/95
Test three axis tool	07/95
Transfer to industry	01/96

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	1,127	0	0	1,127
FISCAL YR 1994	1,035	0	0	1,035
FUTURE FUNDS	0	0	0	0
<b>TOTAL EST'D FUNDS</b>	<b>2,162</b>	<b>0</b>	<b>0</b>	<b>2,162</b>

**PROJECT DESCRIPTION:** This project will develop current Chevron patents and borehole tool into a useful and versatile vibratory borehole seismic source. The design performance of the advanced source includes: 1) three-component output; 2) 6000 lbs force output; 3) 400 F, 10,000 psi capability; 4) 5-1440 Hz frequency band; 5) operated on a special wireline with no hoses. These features will allow crosswell seismic surveys to be used more often and will enhance their utility by providing information on all three polarization components.

**Tasks:**

1. Design of prototype, high-temperature tool.
2. Development and testing of single component prototype tool.
3. Upgrade to a three-component system.
4. Field testing of three-component tool.
5. Transfer technology to industry.

**PRESENT STATUS:** Technical requirements for tool established. Project team meeting regularly on technical issues. Design of single axis source well underway. Contractors selected to fabricate source and electronics.

**ACCOMPLISHMENTS:**

**Technical:**

Evaluated Chevron and Conoco seismic sources.

Identified candidate valves, motors, pumps, fluid, cables and electronics to base design on.

Performed preliminary studies on seals, routing, reaction mass actuator modeling, materials.

Wrote technical specification and requirements for tool, specified operating requirements and environments.

Fabrication of single axis tool complete. Tool tested at Chevron La Habra test facility.

Downhole motor-pump assembly specified and ordered.

Resolved numerous technical issues. Sized components, completed conceptual design, overall tool layout complete, detail design of single axis tool complete.

**Programmatic:**

CRADA established between Sandia and Chevron.

Increased industry participation and significant cost sharing by Conoco, Pelton, E-Systems.

Wrote RFQ, evaluated proposal, and began contract negotiations for detailed design and fabrication of source.

Conoco's seismic source project manager will spend six months at Sandia helping in the design.

Developed project plan, schedule, and goals for the year.

**BACKGROUND:** Crosswell seismic imaging holds great promise at providing improved description of oil reservoirs (and other geologic formations) in the region between wellbores. A primary reason why such imaging is not routinely used is the lack of borehole seismic sources and receivers which can satisfy the demands of the technology. Current seismic sources include both vibrating and impulsive types. The impulsive sources are primarily P-wave generators and are limited by the lack of S-waves, which would be useful for measuring rock properties. There are now various vibratory sources which produce S-waves, but suffer from one or more of the following limitations: 1) low output energy; 2) low frequency operation; 3) only one polarization output; 4) low temperature operation; or 5) difficult deployment. The advanced seismic source to be developed in this project will overcome these limitations. It will be based on hydraulic actuator technology for high output power and will utilize Sandia and Los Alamos expertise in high temperature electronics to achieve high temperature operations. It will also provide three-component polarization output to facilitate determination of rock properties.